

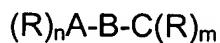
AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions and listings of claims in the application:

1. (Currently amended) A process for the oligomerisation of olefins which includes the step of comprising contacting an olefinic feedstream with a catalyst system which includes the combination of:

[[-]] a transition metal compound; and

[[-]] a heteroatomic ligand described by the following general formula



where

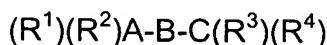
A and C are independently an atom selected from the group consisting of phosphorus, arsenic, antimony, oxygen, bismuth, sulphur, selenium and nitrogen or said atom oxidized by S, Se, N or O, where the valance of A and/or C allows for such oxidation;

B is a linking group between A and C;

the R groups are the same or different and each R is independently selected from a homo hydrocarbyl group and a heterohydrocarbyl group, and at least one R is substituted with has a polar substituent; and

n and m for each R is independently determined by the respective valence and oxidation state of A and C; and

provided that where when the heteroatomic ligand is described by the following general formula



wherein

A and C are independently selected from the group consisting of phosphorus, arsenic, antimony, bismuth and nitrogen;

B is a linking group between A and C; and

each of R¹, R², R³ and R⁴ is independently selected from the group consisting of a non-aromatic group, an aromatic group, and a heteroaromatic group;

at least one of R¹, R², R³ and R⁴, if aromatic, is substituted with has a polar substituent on a 2nd or further atom from the atom bound to A or C and provided that any polar substituents [[on]] that R¹, R², R³ and R⁴ may have, if they are aromatic, are not on the atom adjacent to the atom bound to A or C.

2. (Previously presented) The process as claimed in claim 1, wherein the heteroatomic ligand is described by the following general formula (R¹)(R²)A-B-C(R³)(R⁴) where A and C are independently selected from the group consisting of phosphorus, arsenic, antimony, bismuth, and nitrogen; B is a linking group between A and C; and each of R¹, R², R³ and R⁴ is independently selected from the group consisting of a non-aromatic group, an aromatic group, and a heteroaromatic group.

3. (Original) The process as claimed in claim 2, wherein up to four of R¹, R², R³ and R⁴ have substituents on the atom adjacent to the atom bound to A or C.

4. (Currently amended) The process as claimed in claim 2, which is a tetramerisation process and wherein each of R¹, R², R³ and R⁴ is aromatic, including heteroaromatic, but not all of R¹, R², R³ and R⁴ ~~are substituted by~~ have a substituent on an atom adjacent to the atom bound to A or C.

5. (Original) The process as claimed in claim 4, wherein not more than two of R¹, R², R³ and R⁴ have substituents on the atom adjacent to the atom bound to A or C.
6. (Currently amended) The process as claimed in claim 2, wherein each polar substituent [[on]] that one or more of R¹, R², R³ and R⁴ may have is electron donating.
7. (Previously presented) The process as claimed in claim 4, wherein the feedstream includes an α -olefin and the product stream includes at least 30% of a tetramerised α -olefin monomer.
8. (Previously presented) The process as claimed in claim 7, wherein the olefinic feedstream includes ethylene and the product stream includes at least 30% 1-octene.
9. (Previously presented) The process as claimed in claim 1, wherein the olefinic feedstream includes ethylene and wherein the (C₆ + C₈) : (C₄ + C₁₀) ratio in the product stream is more than 2.5:1.
10. (Previously presented) The process as claimed in claim 1, wherein the olefinic feedstream includes ethylene and wherein the C₈ : C₆ ratio in the product stream is more than 1.
11. (Previously presented) The process as claimed in claim 1, wherein the pressure is greater than 100 kPa (1 barg).
12. (Previously presented) The process as claimed in claim 8, wherein ethylene is contacted with the catalyst system at a pressure of more than 1000 kPa (10 barg).
13. (Previously presented) The process as claimed in claim 1, wherein A and/or C are a potential electron donor for coordination with the transition metal.

14. (Currently amended) The process as claimed in claim 1, wherein B is selected from the group consisting of an organic linking group comprising a hydrocarbyl hydrocarbylene, a substituted hydrocarbyl hydrocarbylene, a hetero hydrocarbyl hydrocarbylene or a substituted hetero hydrocarbyl hydrocarbylene; an inorganic linking group comprising a single atom linking spacer; and a group comprising methylene, dimethylmethylenes, ~~1,2-ethane~~ 1,2-ethylene, 1,2-phenylene, ~~1,2-propane~~ 1,2-propylene, ~~1,2-catechol~~ 1,2-catecholate, ~~1,2-dimethylhydrazine~~ -(CH₃)N-N(CH₃)₂-, -B(R⁵)-, -Si(R⁵)₂-, -P(R⁵)- **[[and]] or** -N(R⁵)-, where R⁵ is hydrogen, a hydrocarbyl or substituted hydrocarbyl, a substituted heteroatom **[[and]] or** a halogen.

15. (Previously presented) The process as claimed in claim 14, wherein B is a single atom linking spacer.

16. (Previously presented) The process as claimed in claim 14, wherein B is -N(R⁵)-, wherein R⁵ is selected from the groups consisting of hydrogen, alkyl, substituted alkyl, aryl, substituted aryl, aryloxy, substituted aryloxy, halogen, nitro, alkoxy carbonyl, carbonyloxy, alkoxy, aminocarbonyl, carbonylamino, dialkylamino, silyl groups or derivatives thereof, and aryl substituted with any of these substituents.

17. (Previously presented) The process as claimed in claim 1, wherein A and/or C is independently oxidised by S, Se, N or O, where the valence of A and/or C allows for such oxidation.

18. (Previously presented) The process as claimed in claim 1, wherein A and C is independently phosphorous or phosphorous oxidised by S or Se or N or O.

19. (Previously presented) The process as claimed in claim 2, wherein R¹, R², R³ and R⁴ are independently selected from the group consisting of benzyl, phenyl, tolyl,

xylyl, mesityl, biphenyl, naphthyl, anthracenyl, methoxy, ethoxy, phenoxy, tolyloxy, dimethylamino, diethylamino, methylethylamino, thiophenyl, pyridyl, thioethyl, thiophenoxy, trimethylsilyl, dimethylhydrazyl, methyl, ethyl, ethenyl, propyl, butyl, propenyl, propynyl, cyclopentyl, cyclohexyl, ferrocenyl and tetrahydrofuranyl group.

20. (Currently amended) The process as claimed in claim 1, wherein the ligand is selected from the group consisting of (3-methoxyphenyl)₂PN(methyl)P(3-methoxyphenyl)₂, (3-methoxyphenyl)₂PN(isopropyl)P(3-methoxyphenyl)₂, (4-methoxyphenyl)₂PN(isopropyl)P(4-methoxyphenyl)₂, (4-methoxyphenyl)₂PN(2-ethylhexyl)P(4-methoxyphenyl)₂, (3-methoxyphenyl)(phenyl)PN(methyl)P(phenyl)₂ [[and]], (4-methoxyphenyl)(phenyl)PN(methyl)P(phenyl)₂, (3-methoxyphenyl)(phenyl)PN(methyl)P(3-methoxyphenyl)(phenyl), (4-methoxyphenyl)(phenyl)PN(methyl)P(4-methoxyphenyl)(phenyl), (3-methoxyphenyl)₂PN(methyl)P(phenyl)₂ [[and]], (4-methoxyphenyl)₂PN(methyl)P(phenyl)₂, (4-methoxyphenyl)₂PN(1-cyclohexylethyl)P(4-methoxyphenyl)₂, (4-methoxyphenyl)₂PN(2-methylcyclohexyl)P(4-methoxyphenyl)₂, (4-methoxyphenyl)₂PN(decyl)P(4-methoxyphenyl)₂, (4-methoxyphenyl)₂PN(pentyl)P(4-methoxyphenyl)₂, (4-methoxyphenyl)₂PN(benzyl)P(4-methoxyphenyl)₂, (4-methoxyphenyl)₂PN(phenyl)P(4-methoxyphenyl)₂, (4-fluorophenyl)₂PN(methyl)P(4-fluorophenyl)₂,

([[2]]3-fluorophenyl)₂PN(methyl)P([[2]]3-fluorophenyl)₂,
(4-dimethylamino-phenyl)₂PN(methyl)P(4-dimethylamino-phenyl)₂,
(4-methoxyphenyl)₂PN(allyl)P(4-methoxyphenyl)₂,
(4-(4-methoxyphenyl)-phenyl)₂PN(isopropyl)P(4-(4-methoxyphenyl)-phenyl)₂ and
(4-methoxyphenyl)(phenyl)PN(isopropyl)P(phenyl)₂.

21. (Previously presented) The process as claimed in claim 1, wherein the catalyst system is prepared by combining in any order the heteroatomic ligand with the transition metal compound and an activator.

22. (Original) The process as claimed in claim 21, which includes the step of adding a pre-formed coordination complex, prepared using the heteroatomic ligand and the transition metal compound, to a reaction mixture containing the activator.

23. (Original) The process as claimed in claim 21, which includes the step of generating a heteroatomic coordination complex *in situ* from the transition metal compound and a heteroatomic ligand.

24. (Previously presented) The process as claimed in claim 1, wherein the transition metal in the transition metal compound is selected from the group consisting of chromium, molybdenum, tungsten, titanium, tantalum, vanadium and zirconium.

25. (Original) The process as claimed in claim 24, wherein the transition metal is chromium.

26. (Previously presented) The process as claimed in claim 1, wherein the transition metal compound is selected from the group consisting of an inorganic salt, an organic salt, a co-ordination complex and an organometallic complex.

27. (Previously presented) The process as claimed in claim 26, wherein the transition metal compound is selected from the group consisting of chromium trichloride tris-tetrahydrofuran complex, (benzene)tricarbonyl chromium, chromium (III) octanoate, chromium (III) acetylacetonate, chromium hexacarbonyl and chromium (III) 2-ethylhexanoate.

28. (Original) The process as claimed in claim 27, wherein the transition metal compound is selected from a complex selected from chromium (III) acetylacetonate and chromium (III) 2-ethylhexanoate.

29. (Currently amended) The process as claimed in claim 1, wherein ~~the~~ transition metal from the transition metal compound and the heteroatomic ligand are combined to provide a transition metal/ligand ratio from about 0.01:100 to 10 000:1.

30. (Currently amended) The process as claimed in claim 21, wherein the catalyst system further includes an activator selected from the group consisting of an organoaluminium compound, an organoboron compound, an organic salt, an inorganic acid and salt, ~~such as tetrafluoroberic acid etherate, silver tetrafluoroborate and sodium hexafluoroantimonate.~~

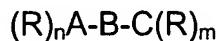
31. (Original) The process as claimed in claim 30, wherein the activator is an alkylaluminoxane.

32. (Original) The process as claimed in claim 31, wherein the transition metal compound and the aluminoxane are combined in proportions to provide an Al/transition metal ratio from about 1:1 to 10 000:1.

33. (Currently amended) A tetramerisation catalyst system ~~which includes the combination of~~ comprising:

[[I-]] a transition metal compound; and

[[I-]] a heteroatomic ligand described by the following general formula



where

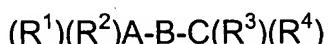
A and C are independently an atom selected from the group consisting of phosphorus, arsenic, antimony, oxygen, bismuth, sulphur, selenium and nitrogen or said atom oxidized by S, Se, N or O, where the valance of A and/or C allows for such oxidation;

B is a linking group between A and C;

the R groups are the same or different and each R is independently selected from a homo hydrocarbyl group and a heterohydrocarbyl group, and at least one R is substituted with has a polar substituent; and

n and m for each R is independently determined by the respective valence and oxidation state of A and C; and

provided that where when the heteroatomic ligand is described by the following general formula



wherein

A and C are independently selected from the group consisting of phosphorus, arsenic, antimony, bismuth and nitrogen;

B is a linking group between A and C; and

each of R¹, R², R³ and R⁴ is independently selected from the group consisting of a non-aromatic group, an aromatic group, and a heteroaromatic group;

at least one of R¹, R², R³ and R⁴, if aromatic is substituted with, has a polar substituent on a 2nd or further atom from the atom bound to A or C and provided that any polar substituents [[on]] that R¹, R², R³ and R⁴ may have, if they are aromatic, are not on the atom adjacent to the atom bound to A or C.

34. (Previously presented) The catalyst system as claimed in claim 33, wherein the heteroatomic ligand is described by the following general formula (R¹)(R²)A-B-C(R³)(R⁴) where A and C are independently selected from the group consisting of phosphorus, arsenic, antimony, bismuth, and nitrogen; B is a linking group between A and C; and each of R¹, R², R³ and R⁴ is independently selected from the group consisting of a non-aromatic group, an aromatic group, and a heteroaromatic group.

35. (Currently amended) The catalyst system as claimed in claim 34, wherein each of R¹, R², R³ and R⁴ is aromatic, including heteroaromatic, but not all of R¹, R², R³ and R⁴ are substituted by an have a substituent on an atom adjacent to the atom bound to A or C.

36. (Original) The catalyst system as claimed in claim 35, wherein not more than two of R¹, R², R³ and R⁴ have substituents on the atom adjacent to the atom bound to A or C.

37. (Currently amended) The catalyst system as claimed in claim 34, wherein each polar substituent [[on]] that one or more of R¹, R², R³ and R⁴ may have is electron donating.

38. (Previously presented) The catalyst system as claimed in claim 33, wherein A and/or C are a potential electron donor for coordination with the transition metal.

39. (Currently amended) The catalyst system as claimed in claim 33, wherein B is selected from the group consisting of an organic linking group comprising a hydrocarbyl hydrocarbylene, a substituted hydrocarbyl hydrocarbylene, a hetero hydrocarbyl and hydrocarbylene or a substituted hetero hydrocarbyl hydrocarbylene; an inorganic linking group comprising a single atom linking spacer; and a group comprising methylene, dimethylmethylen, 1,2-ethane 1,2-ethylene, 1,2-phenylene, 1,2-propane 1,2-propylene, 1,2-catechol 1,2-catecholate, 1,2-dimethylhydrazine -(CH₃)N-N(CH₃)-, -B(R⁵)-, -Si(R⁵)₂-, -P(R⁵)-, [[and]] or -N(R⁵)-, where R⁵ is hydrogen, a hydrocarbyl or substituted hydrocarbyl, a substituted heteroatom [[and]] or a halogen.

40. (Original) The catalyst system as claimed in claim 39, wherein B is a single atom linking spacer.

41. (Original) The catalyst system as claimed in claim 39, wherein B is selected to be -N(R⁵)-, wherein R⁵ is selected from the groups consisting of hydrogen, alkyl, substituted alkyl, aryl, substituted aryl, aryloxy, substituted aryloxy, halogen, nitro, alkoxy carbonyl, carbonyloxy, alkoxy, aminocarbonyl, carbonylamino, dialkylamino, silyl groups or derivatives thereof, and aryl substituted with any of these substituents.

42. (Previously presented) The catalyst system as claimed in claim 33, wherein A and/or C is independently oxidised by S, Se, N or O, where the valence of A and/or C allows for such oxidation.

43. (Previously presented) The catalyst system as claimed in claim 33, wherein A and C is independently phosphorus or phosphorus oxidised by S or Se or N or O.

44. (Currently amended) The catalyst system as claimed in claim 33, wherein the ligand is selected from the group consisting of (3-methoxyphenyl)₂PN(methyl)P

(3-methoxyphenyl)₂, (4-methoxyphenyl)₂PN(methyl)P(4-methoxyphenyl)₂,
(3-methoxyphenyl)₂PN(isopropyl)P(3-methoxyphenyl)₂,
(4-methoxyphenyl)₂PN(isopropyl)P(4-methoxyphenyl)₂,
(4-methoxyphenyl)₂PN(2-ethylhexyl)P(4-methoxyphenyl)₂,
(3-methoxyphenyl)(phenyl)PN(methyl)P(phenyl)₂ and
(4-methoxyphenyl)(phenyl)PN(methyl)P(phenyl)₂,
(3-methoxyphenyl)(phenyl)PN(methyl)P(3-methoxyphenyl)(phenyl),
(4-methoxyphenyl)(phenyl)PN(methyl)P(4-methoxyphenyl)(phenyl),
(3-methoxyphenyl)₂PN(methyl)P(phenyl)₂ and (4-methoxyphenyl)₂PN(methyl)
P(phenyl)₂,
(4-methoxyphenyl)₂PN(1-cyclohexylethyl)P(4-methoxyphenyl)₂,
(4-methoxyphenyl)₂PN(2-]methylcyclohexyl)P(4-methoxyphenyl)₂,
(4-methoxyphenyl)₂PN(decyl)P(4-methoxyphenyl)₂,
(4-methoxyphenyl)₂PN(pentyl)P(4-methoxyphenyl)₂,
(4-methoxyphenyl)₂PN(benzyl)P(4-methoxyphenyl)₂,
(4-methoxyphenyl)₂PN(phenyl)P(4-methoxyphenyl)₂,
(4-fluorophenyl)₂PN(methyl)P(4-fluorophenyl)₂,
([2]3-fluorophenyl)₂PN(methyl)P([2]3-fluorophenyl)₂,
(4-dimethylamino-phenyl)₂PN(methyl)P(4-dimethylamino-phenyl)₂,
(4-methoxyphenyl)₂PN(allyl)P(4-methoxyphenyl)₂,
(4-(4-methoxyphenyl)-phenyl)₂PN(isopropyl)P(4-(4-methoxyphenyl)-phenyl)₂
and (4-methoxyphenyl)(phenyl)PN(isopropyl)P(phenyl)₂.

45. (Previously presented) The catalyst system as claimed in claim 33, wherein the transition metal in the transition metal compound is selected from the group consisting of chromium, molybdenum, tungsten, titanium, tantalum, vanadium and zirconium.

46. (Original) The catalyst system as claimed in claim 45, wherein the transition metal is chromium.

47. (Previously presented) The catalyst system as claimed in claim 33, wherein the transition metal compound is selected from the group consisting of an inorganic salt, an organic salt, a co-ordination complex and an organometallic complex.

48. (Original) The catalyst system as claimed in claim 47, wherein the transition metal compound is selected from the group consisting of chromium trichloride tris-tetrahydrofuran complex, (benzene)tricarbonyl chromium, chromium (III) octanoate, chromium (III) acetylacetonate, chromium hexacarbonyl, and chromium (III) 2-ethylhexanoate.

49. (Previously presented) The catalyst system as claimed in claim 48, wherein the transition metal is selected from a complex selected from chromium (III) acetylacetonate and chromium (III) 2-ethylhexanoate.

50. (Currently amended) The catalyst system as claimed in claim 33, wherein ~~the transition metal from~~ the transition metal compound and the heteroatomic ligand are combined to provide a transition metal/ligand ratio from about 0.01:100 to 10 000:1.

51. (Currently amended) The catalyst system as claimed in claim 33, which further includes an activator.

52. (Currently amended) The catalyst system as claimed in claim 51, wherein the activator is selected from the group consisting of an organoaluminium compound, an organoboron compound, an organic salt, ~~such as methylolithium and methylmagnesium bromide, an inorganic acid and salt, such as tetrafluoroboric acid-etherate, silver tetrafluoroborate and sodium hexafluoroantimonate.~~

53. (Original) The catalyst system as claimed in claim 52, wherein the activator is an alkylaluminoxane.

54. (Original) The catalyst system as claimed in claim 53, wherein the alkylaluminoxane is selected from the group consisting of methylaluminoxane (MAO), ethylaluminoxane (EAO) modified alkylaluminoxanes (MMAO), and mixtures thereof.

55. (Previously presented) The catalyst system as claimed in claim 53, wherein the transition metal and the aluminoxane are combined in proportions to provide an Al/transition metal ratio from about 1:1 to 10 000:1.

56-57.(Cancelled).

58. (New) The process of claim 30, wherein the activator is methylolithium, methylmagnesium bromide, tetrafluoroboric acid diethylether complex, silver tetrafluoroborate or sodium hexafluoroantimonate.

59. (New) The process of claim 52, wherein the activator is methylolithium, methylmagnesium bromide, tetrafluoroboric acid diethylether complex, silver tetrafluoroborate or sodium hexafluoroantimonate.